

XLIII. *Astronomical Observations, made in the Forks of the River Brandiwine in Pennsylvania, for determining the going of a Clock sent thither by the Royal Society, in order to find the Difference of Gravity between the Royal Observatory at Greenwich, and the Place where the Clock was set up in Pennsylvania; to which are added, an Observation of the End of an Eclipse of the Moon, and some Immersions of Jupiter's First Satellite observed at the same Place in Pennsylvania: By Charles Mason and Jeremiah Dixon.*

Read December 15, 1768.

The Place where these Observations were made is the Northernmost Point of the Lines that were measured for a Degree of Latitude, or Point N. (see TAB. XIII. fig. 2.) relative to that Measure; it lies 31 Miles West, by Measurement; and 10", 5 South of the Southernmost Point of the City of Philadelphia, as found by the Sector.

1766		Time per Clock.					
Decemb.	d	h	'	"	h	'	"
8	24	{	4	28	40	
.. *	..			30	18+	5	25 3
				32	5½	26	40
		} Equal Altitudes of Capella.					
	28	{	4	28	41	5	20 59
.. *	..			30	22+	22	47-
				32	10	24	30½
		} Equal Altitudes of ditto.					
	30	{	4	5	52½	5	43 24+
.. *	..			7	12	44	46½
				8	34	46	4½
		} Equal Altitudes of ditto.					
1767							
January.							
24	1	4	10	33	5	37	45
			11	55		39	10
			13	19½		40	31-
						U	u
						} Equal Altitudes of ditto.	
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Time per Clock.

January.	d	h	'	"	h	'	"	
♂	7	3	50	26	5	55	8 $\frac{1}{2}$	} Equal altitudes of Capella.
			51	39+		56	27	
			52	56 $\frac{1}{2}$		57	41 $\frac{1}{2}$	
♂	8	4	4	48	5	40	3	} Equal altitudes of ditto.
			6	7 $\frac{1}{2}$		41	24	
			7	30—		42	44 $\frac{1}{2}$	
.. *	12	59	30					{ The first Satellite of Jupiter immersed. Apparent time 8 17 42 47 $\frac{1}{2}$
♂	10	6	21	28	8	2	45	
.. *			22	43		4	3	} Equal altitudes of Castor.
			24	00		5	18—	
	7	34	18					{ The first Satellite of Jupiter immersed. Apparent time 10 12 10 23.
♀	16	4	5	4+	5	35	23	
.. *			6	25		36	47	} Equal altitudes of Capella.
			7	50		38	7	
♂	19	4	4	8 $\frac{1}{2}$	5	34	44	} Equal altitudes of ditto.
.. *			5	27 $\frac{1}{2}$		36	8	
			6	52		37	29	
♂	27	3	32	53	6	2	7	} Equal altitudes of ditto.
			34	5—		3	21 $\frac{1}{2}$	
			35	19 $\frac{1}{2}$		4	34 $\frac{1}{2}$	
February.								
♂	3	4	21	12 $\frac{1}{2}$	6	36	10 $\frac{1}{2}$	} Equal altitudes of β Aurigæ . . Windy.
.. *			22	22		37	24	
			23	35+		38	34 :	
♂	4	3	34	52—	5	56	0 $\frac{1}{2}$	} Equal altitudes of Capella.
			36	5		57	16+	
			37	20		58	29	
☉	8	3	55	32	5	33	5 $\frac{1}{2}$	} Equal altitudes of ditto.
.. *			56	50+		34	26+	
			58	12		35	45 $\frac{1}{2}$	
♂	16	13	44	50	{ The first Satellite of Jupiter was not immersed } flying Ditto was immersed. } clouds.			
.. *		13	46	25				
♂	25	4	11	43—	5	7	9	} Equal altitudes of Capella.
			13	21		8	55 $\frac{1}{2}$	
			15	7—		10	32+	
.. *	10	42	50	: First Satellite of γ immersed. Ap. time 25 ^d 12 ^h 24' 40": : From				

From these observations we have the time of Capella's passing the meridian, and the rate of the clock's going as follows :

1766	* passed merid. per clock.			Clock loses of Sid. time per day.	Mean state of therm.	1764 March.	D eclipsed Time per watch.		
Decemb.	h	'	"	"	o	h	'	"	
24	4	57	40+	16,3	35	h 17 8	4	10	
28		56	35	18,0	23	Eclipse of the D			
1767					6	ended.			
January.	30	55	59	13,4	6	h	'	"	
1		55	32+	14,8	37	8 58 46	10 27 30::	} Equal altitud. of Re- gulus.	
7		54	3	17,0	20	9 1 16	29 41		
8		53	46	16,3	37	4 5	32 9		
16		51	36	16,0	31	The watch went very regular sider. time.			
19		50	48+	15,63	33	—Hence the eclipse ended at 8 ^h 21' 59" app. time, in the forks of the river Bran- diwine.			
27		48	43+	15,35	28				
February.	4	46	40½	15,5	30				
8		45	38½	15,9	35				
25		41	8—						

N. B. The edge of the earth's shadow on the D's disk was the best defined I ever saw : it was remarkably distinct from the penumbral shade.

N. B. The clock was firmly screwed to a piece of timber, 22 inches in breadth, and five inches and a quarter thick ; the said piece of timber was let four feet into the ground, which was composed of a very firm, dry, hard clay.

The clock was placed in a tent, with Fahrenheit's thermometer hung to its side ; and a blanket was wraped round the clock and thermometer, to secure it from any wind that might enter the tent. The pendulum was adjusted to the upper scratch, with N° 3, at the Index, as directed by the Rev. Mr. Maskelyne, Astronomer Royal : but the spring at the suspension of the pendulum having been broke, (when the ship, in which it was sent, was wrecked on the Jersey coast) we cannot be certain that the pendulum is now of the same length as it was when sent from London.

Those observations marked : are a little dubious ; those marked :: are very dubious ; those marked . . * were made per Mr. Dixon. The eclipses of 24's satellites were observed with a reflecting telescope of one foot focus, that magnified about 70 times.

1766	Height of the ther. at about 7 ^h in the mor. in the		Height of the ther. at about 2 ^h in the after. in the		Vibration of the pend. on each side of O. that is, half the arch of vi- bration.		
	Tent	Air	Tent	Air			
Decemb. d							
8	24	43	45—			
	25	44	46			
	26	38 37	45	47	1	40—	
	27	38 41	40	42			
	28	21 18	31	26	1	35	Near midn. the ther. in { Tent 20 the { Air 16
	29		28	28			At 10 ^h ¼ P. M. therm. { Tent 29 in the { Air 28
	30		32	32			Near midn. in the Tent 17 Air 14
	31	5 above O. 3 below O.	18	20	both above O.		

1767 3^r At 8^h $\frac{3}{4}$ P. M. ther. in the tent at O. in the air at 7 below O.
 At 10^h $\frac{3}{4}$ P. M. ditto in the tent at 3 below O. in the air at 13 below O.
 Jan. 1 At 7^h 6' in the morn. the ther. in the $\left\{ \begin{array}{l} \text{Tent } 10 \\ \text{Air } 20 \end{array} \right\}$ below O.
 At 0^h 45' P. M. ther. in the $\left\{ \begin{array}{l} \text{Tent } 21 \\ \text{Air } 17 \end{array} \right\}$ above O. Vibration = 1° 12'
 At 11^h 4' P. M. ditto in the $\left\{ \begin{array}{l} \text{Tent } = 3 \\ \text{Air } = 12 \end{array} \right\}$ below O. Vibration = 1° 10'

At 10 ditto vibration of the pendulum = $1^{\circ} 5'$ on each side of O.
The pendulum now swings a little farther on the west side of O. than
on the east side. The clock faces the north.

At $8\frac{1}{2}$ P. M. in the { Tent 43
Air 44

{ Pend. swings 8' more on the
east side of O. than on the w.
At midn. ther. in the air 25.

At 4 P. M. in the { Tent 42
Air 44

The pend. swings as on the 9th.

15 33 39 41

1767 January		Height of the ther. at about 7 ^h in the mor. in the		Height of the ther. at about 2 ^h in the aft. in the		Half the arch of vibration.			
		Tent	Air	Tent	Air				
16	30	30	39	37	1° 35'	The pend. fwings as before.			
At 9 ^h 5½ P. M. ther. in the						{ Tent 24 Air 21			
17	at 9 ^h A. M. { 28tent 25 air		43	39					
18	33	31	39	39					
19	25	26	39	36	At 9 ^h ½ P. M. ther. in the		{ Tent 21 Air 18		
20			39	40					
21	39	39	40	40					
22	23	21	27	27	1° 30'	{ The pendulum fwings to the eastward as before.			
23	25	23	32	32					
24	32	32	43	40	1° 30'	Wound up the clock.			
15	32	32	31	30					
26	28	27	At 4 ^h ½ P. M. ther. in the		{ Tent 32 Air 32				
27	21	20	At 4 ^h ½ P. M. in the		{ Tent 27 Air 25				
			9 ditto		{ Tent 15 Air 12				
28	11	14	36	32	1° 20'	The pendulum fwings as before.			
29	15	13	35	34					
30	16	16	31	35	1 20				
31	32	35	At 4 ^h ¼ P. M. in the		{ Tent 36 Air 36				
Feb. 1	36	35	36	37					
2	15	13	40	34					
3	16	15	41	38	1° 30'				
At 9 ^h ½ P. M. in the						{ Tent 26 Air 25			
4	14	10	34	32	1° 30'				
At 9 ^h P. M. in the						{ Tent 24 Air 23			
5	30	32	45	41					
6	13	12	28	24	1 30				
7	13	12	34	36					

1767 Febr.	a	Height of the ther. at about 7 ^h in the mor. in the		Height of the ther. at about 2 ^h in the aft. in the		Half the arch of vibration.
		Tent	Air	Tent	Air	
	8	25	24	54	52	1° 35'
		At 8 ^h $\frac{1}{2}$ P. M. in the				{ Tent 33 ⁻ Air 32
	9	32	32	42	41	
	10	41	41	34	35	
	11	25	25	40	38	1 40 The pendulum fwings as before.
	12	30	29	38	41	
	13	31	31	32	33	
	14	28	24			
	15	26	27	At 4 ^h P. M. in the		{ Tent 34 Air 33
	16	18	10	39	48	
	17	25	17	28	28	
	19			39	44	
♀	20	near noon { tent 46 air 55		48	59	
⊙	22	14	12			
♂	28			69		1° 40' { Pend. vibrates about 8' farther on the E. fide of O, than on the W. fide of O, as before.
March	1			56		
	2			46		
	3			57		
	4			49		
	5			51		
	6			51		
	7			48		
	8			56		
	9			51		
	10			50		
	12	at ⊙ rise 11		26		
	13	ditto 7		28		
	14			36		
	15			47		
	16			71		
	17			67		
	18	snow				
June	4			91		
	5			95		
	6			95		

The point of the pendulum fwings something farther back from the arch (fwewing the degrees and minutes) than it did when it was fet up.

Took down and packed up the clock.

1767 June	d	Height of the ther. at about 7 ^h in the mor. in the		Height of the ther. at about 2 ^h in the aft. in the	
		Tent	Air	Tent	Air
	7				93
	8				91
	9				80
10	At 4 ^h $\frac{1}{2}$ P.M.		90 at 7 ^h P.M. 80		

{ The air much altered, being very cool and pleasant.

N. B. The thermometer is in the shade, and in the same place it was in last winter.